

REMARKS/ARGUMENTS

Claims 70, 83 and 97 are amended, claims 76 and 90 are cancelled and new claims 112-125 have been added. Therefore, claims 70-75, 76-89 and 91-125 are pending in this application. 

Support for the amendments of claim 70 can be found in paragraph [0018] of the substitute specification filed April 21, 2003.

Support for the amendment of claims 83 and 97 can be found in paragraph [0016], [0052] and [0053].

Support for new claims 113 and 124 can be found in paragraph [0009].

Support for new claims 114 and 125 can be found in paragraphs [0037], [0060], [0062] and [0071].

Support for new claims 115 and 123 can be found in paragraph [0018].

Support for new claims 116 and 117 can be found in paragraph [0013].

Support for new claims 118, 119, 121 and 122 can be found in paragraphs [0018] and [0053].

Support for new claim 120 can be found in paragraph [0037].

In the final Office Action mailed March 26, 2004, claims 70-96 were rejected under 35 USC 112, first paragraph as failing to comply with the written description requirement. In response, the words „previously substantially uncleaned“ have been removed from the claims. Thus, it is believed that this rejection has been overcome, as well as the indefiniteness rejection under 35 USC 112, second paragraph covering the same claims.

Claims 70-112 were rejected under 35 USC 112, first paragraph, as lacking enablement for the full scope of the claims. Applicants traverse this rejection.

In order to clarify the record and explain the scope of the present liquid cleaning compositions, a brief description of emulsions, as used in the present application, and microemulsions as utilized in U.S. Patent No. 5,597,792 („Klier et al.“) will be provided.

As indicated at column 3, lines 3-6 of Klier et al., „microemulsions“ are generally understood to be liquid compositions that are in thermodynamic equilibrium, and which have particles suspended therein having sizes less than 100 nanometers. If the microemulsion has such small particle sizes, the microemulsions generally have the property of being optically clear or translucent and appear to be a uniform single phase to the human eye. In other words, the microemulsion has the visual appearance of being uniform or one-phase, but at a microscopic level, microemulsions actually possess a plurality of droplets of an immiscible liquid dispersed in a continuous phase. Thus, in microemulsions, the two immiscible liquids are not fully dissolved in each other, thereby comprising a dispersion of one liquid in a second immiscible liquid. Moreover, as is described by Klier et al., microemulsions are thermodynamically stable.

Furthermore, it is noted that such microemulsions typically do not lose the property of being optically or visually one-phase, e.g., by agitation, because they are stable emulsions. Thus, a „one-phase oil continuous microemulsion“ will generally remain a one-phase oil continuous microemulsion. Moreover, application of ultrasound or agitation also will not change a one-phase microemulsion into a two-phase solution.

On the other hand, as was explained in the McGraw-Hill definition of an „emulsion,“ which document was cited in the Form PTO-892 attached to the Office

Action mailed August 16, 2000 for this application and is attached hereto for the Examiner's convenience, „a stable emulsion consisting of two pure liquids cannot be prepared; to achieve stability, an emulsifying agent, must be present.“ Thus, in contrast to an „emulsion,“ a „microemulsion“ is characterized as containing a sufficient amount of an emulsifying agent (e.g., surfactant) to maintain the thermal stability of the dispersion of one immiscible liquid in a continuous phase of another liquid. In other words, the dispersion of one liquid phase into another immiscible liquid phase is stabilized by an interfacial film of surfactant. At col. 8, lines 46-62 of Klier et al., it is suggested to utilize the minimum amount of surfactant necessary to prepare a microemulsion system. However, in all aspects of the teachings of Klier et al., it is taught that a microemulsion (i.e., a thermodynamically stable dispersion of two immiscible liquids) is an essential aspect of their teachings and Klier et al. make no suggestion, and provide no motivation, for disregarding this essential requirement of their cleaning solutions.

At col. 2, lines 7-9, Klier et al. indicates that emulsions are then prepared by adding an excess of water to such one-phase, oil continuous microemulsions, thereby creating a „two-phase emulsion.“ As should be clear from the McGraw-Hill definition of an emulsion, an emulsion is unstable, such that the suspended droplets will eventually agglomerate and the dispersed phase will phase separate if allowed to rest at a temperature at which the two phases are not fully miscible. It is noted that emulsions generally fall into two types, macroemulsions and miniemulsions, which are defined according to the dispersed particle sizes. Macroemulsions are characterized as containing particle sizes larger than 100 nanometers, such that the macroemulsion typically has a milky or optically cloudy appearance. Miniemulsions

are characterized as having particle sizes less than 100 nanometers, such that the miniemulsion has an optically clear or translucent appearance. In other words, miniemulsions have the visual appearance of being a uniform, one-phase, but in fact the two phases are not completely miscible (fully dissolved) at a microscopic level. Moreover, it should still be understood that miniemulsions are defined as being thermodynamically unstable in contrast to microemulsions, which are thermodynamically stable.

Thus, when Klier et al. teach emulsions that comprise oil continuous microemulsions, a skilled person understands that sufficient water is added to the oil continuous microemulsions of Klier et al. such that when the mixture is allowed to rest at 25°C, two-liquid phases will be visually apparent. One phase will be an aqueous phase, which will likely be a fully dissolved phase, and the other phase will be an oil continuous microemulsion, in which water droplets are dispersed in an oil continuous phase, but the water droplets are so small that the human eye can not visually discern the dispersed droplets. Thus, the microemulsion phase still visually appears as a uniform, one-phase liquid.

As was indicated above, although such water/microemulsion emulsions would have the visual appearance of being two phases, because the water particles dispersed in the oil continuous phase are less than 100 nanometers in size, it should be understood that the microemulsion phase is, in fact, not a fully dissolved phase. Thus, the „emulsions“ of Klier et al. have at least 3, and possibly more, phases at a microscopic level. Moreover, the water/microemulsion emulsions of Klier et al. do not visually become one-phase solutions, due to the thermodynamically stable nature of the microemulsions taught therein.

In contrast to the teachings of Klier et al., the present teachings generally rely upon emulsions that are unstable. Thus, when the presently claimed liquid cleaning compositions are allowed to rest at the cleaning temperature, two phases will be visually apparent. In certain preferred embodiments, each phase is a fully dissolved phase when the two-phase solution has reached equilibrium. In other words, at equilibrium, the water-rich phase will include a quantity of fully dissolved organic and the organic-rich phase will include a quantity of fully dissolved water. There will be no dispersed particles in either phase at this time. However, the broadest claims should not be construed as being limited to such preferred embodiments.

In another preferred aspect, the present liquid cleaning compositions also have the property of visually becoming a one-phase solution at a different temperature. As noted above, the water/microemulsion emulsions of Klier et al. are not capable of visually appearing as a one-phase solution due to the inclusion of the thermodynamically stable microemulsions therein.

As was explained by the McGraw Hill definition of an emulsion, when two, at least partially, immiscible liquids are agitated (ultrasound may also be applied thereto), an unstable emulsion will be generated. In the present teachings, due to the relatively large concentration of water (i.e., about 65-99% by weight) in the liquid cleaning compositions, upon application of ultrasound or agitation to the two-phase liquid cleaning composition, organic rich droplets will become dispersed in an aqueous continuous phase. However, this emulsion is unstable and the phases will again agglomerate and separate when allowed to rest at a temperature, at which the cleaning solution forms a two-phase liquid. Furthermore, certain preferred liquid cleaning compositions of the present teachings will visually appear as a one-phase

liquid at a temperature that is different from (e.g., lower than) the cleaning temperature.

Although one or more surfactants (or other additives of a different nature) can be added to the liquid cleaning compositions of the present teachings, it should be clear from the specification that the amount of surfactant that is added will not be sufficient to generate a thermodynamically stable microemulsion in the liquid cleaning composition. Although no surfactant is preferably utilized, the present teachings and broadest claims are, however, not limited to this preferred embodiment.

Thus, the present teachings clearly distinguish from Klier et al, because Klier et al. require a minimum amount of surfactant to generate a oil continuous microemulsion phase. Thus, the oil continuous microemulsion will appear visually as a single phase and does not transition between a one-phase solution and a two-phase solution by changing the temperature thereof. Furthermore, when excess water is added to the oil continuous microemulsions of Klier et al., such that a water/microemulsion solution is formed, which will visually appear to be two-phases when allowed to rest at 25°C, such a solution will not have the visual appearance of a one-phase solution, due to the thermodynamically stable microemulsion that can not absorb the excess water. Furthermore, the oil continuous microemulsion phase of Klier et al. is not a fully dissolved phase, but rather is a dispersion of water droplets in a continuous oil phase.

At page 3 of the final Office Action, it was stated that „The claims require an oil-in-water emulsion. U.S. Patent 5,597,792 teaches that for most of water concentrations the claimed mixture of dipropylene glycol mono-n-propyl ether and

water would form water-in-oil emulsion.“ As an initial matter, Applicants do not accept the Examiner’s characterization that the claims require „oil-in-water emulsions.“ Instead, it should be noted that the claims relate to „organic-in-water emulsions.“

Moreover, as is hopefully clear from the above discussion, due to the essential requirement of adding a minimum amount of surfactant so as to form oil continuous microemulsions in Klier et al., even liquid compositions containing a large excess of water will form an aqueous phase and an oil continuous microemulsion phase according to the cleaning liquids of Klier et al. Similarly, in a large excess of water, the organic components of the present teachings form an aqueous phase and an organic-rich phase. A significant difference is that, in the absence of the minimum amount of surfactant necessary to form a microemulsion, the present cleaning liquid compositions will not include a thermodynamically stable microemulsion phase. As a result, preferred liquid cleaning compositions can visually transition between one-phase liquid solutions and two-phase liquid solutions by changing the temperature thereof.

Thus, it is believed that this explanation not only establishes why the emulsions of Klier et al. are different from the present liquid cleaning compositions, but should also explain why it is not necessary to include further concentration limitations and/or conditions in the claims. A skilled person would understand from the properties recited in the present claims that thermodynamically stable microemulsions are not formed in the present liquid cleaning compositions and can readily make liquid cleaning compositions that satisfy the present claims by consulting the teachings of this specification either alone, or in conjunction with

textbooks concerning the preparation of unstable emulsions or by mere routine, simple experimentation, if necessary. It is, therefore, requested to withdraw the lack of enablement rejection.

Finally, in paragraph 8, many of the claims were also rejected as lacking novelty over Klier et al.. It is believed that the above discussion clearly demonstrates why the present claims distinguish from Klier et al. Thus, it is believed that only a brief explanation of the differences from Klier et al. need be recited.

Claim 70 distinguishes from Klier et al. for at least the reason that none of the microemulsions or water/microemulsion emulsions of Klier et al. have the property of „all components of the liquid cleaning composition are fully dissolved at a temperature that is lower than a cleaning temperature.“ Due to the inclusion of the microemulsion forming amount of surfactant, thermodynamically stable microemulsions are formed in the Klier et al. solutions, which microemulsions will always have a dispersion of water droplets in an oil continuous phase, even when the temperature of the cleaning liquid is reduced.

Claim 83 distinguishes from Klier et al. for at least the reason that none of the microemulsions or water/microemulsion emulsions of Klier et al. have the property of „the concentration of the at least one organic compound is greater than the solubility of the at least one organic compound in water at a cleaning temperature, such that the liquid cleaning composition is a two-phase solution at the cleaning temperature, and wherein the liquid cleaning composition has the properties of: being a one-phase solution at a temperature that is lower than the cleaning temperature.“ As was discussed above, the oil continuous microemulsions of Klier et al. will always visually appear to be one-phase regardless of whether the temperature of the oil continuous

microemulsion is reduced, because the microemulsions of Klier et al. are thermodynamically stable. For the same reason, the water/microemulsion emulsions of Klier et al. will always visually appear to be two phases even if the temperature is lowered.

Claim 97 distinguishes from Klier et al. for at least the reason that none of the microemulsions or water/microemulsion emulsions of Klier et al. have the property of „the concentration of the at least one organic compound is greater than the solubility of the at least one organic compound in water at the cleaning temperature, such that the liquid cleaning composition is a two-phase solution at the cleaning temperature, and wherein the liquid cleaning composition also has the property of forming a one-phase solution at a temperature that is different from the cleaning temperature.“ Similar to claim 83, the oil continuous microemulsions of Klier et al. will visually appear to be one-phase regardless of temperature changes. Again, for the same reason, the water/microemulsion emulsions of Klier et al. will always visually appear to be two phase regardless of temperature changes.

Claim 119 distinguishes from Klier et al. for at least the reason that none of the microemulsions or water/microemulsion emulsions of Klier et al. have the property of „the concentration of the at least one organic compound is greater than the solubility of the at least one organic compound in water at the cleaning temperature, such that the liquid cleaning composition is a two-phase liquid at the cleaning temperature, which two-phase liquid comprises an organic-rich phase and an aqueous phase, the organic-rich phase being a fully dissolved phase in the absence of agitation or ultrasound.“ Instead, as indicated by Klier et al. at col. 2, lines 7-9, when allowed to rest at room temperature, the water/microemulsions form

a visual two-phase solution, in which the organic phase (i.e., the microemulsion phase) is not fully dissolved, but is rather defined by a dispersion of water-rich droplets in a continuous organic phase.

As was discussed in the present specification, the liquid cleaning compositions of the present teachings provide remarkably effective cleaning when used according to the claimed methods. Objects can be efficiently and cost-effectively cleaned of hydrophobic and hydrophilic contaminants with minimal or no residue, which has been a problem of cleaning solutions based upon microemulsions. In particular, microemulsions have been known to demonstrate less effective cleaning and greater problems with residues, in particular surfactants, remaining on the „cleaned“ object.

Although not wishing to be bound by theory, it is believed that an unstable dispersion of organic droplets in water presents a variety of solvent concentrations to the surface of the object. In other words, at a microscopic level, a spectrum of solvent environments can be created by e.g., agitating or applying ultrasound to the present liquid cleaning compositions, which spectrum of solvent environments extend from highly organic-rich to highly aqueous. These varying solvent environments or concentrations are temporarily, but repeatedly, and locally created. This spectrum of solvent environments (concentrations) thereby enables the present liquid cleaning compositions to solubilize a wide variety of contaminants having different solubility characteristics, because a range of solvent concentrations (i.e., from highly hydrophobic to highly hydrophilic) contacts the surface of the object. Moreover, once the contaminants are removed from the surface of the object, the contaminants do not reattach to the object, but rather typically float to the surface or

fall to the bottom of the cleaning solution, depending upon the relative densities of the contaminants and the organic and water phases.

Prior to the present invention, the common thinking in the field was to create highly uniform solvents that will provide uniform cleaning properties. However, in fact, cleaning solvents capable of creating highly variable, local solvent conditions provide far better cleaning and leave little or no residue on the cleaned object. Thus, these surprising results derive from rejecting the commonly utilized cleaning theory in the field.

Thus, for all the foregoing reasons, it is believed that all rejections in the final Office Action mailed March 26, 2004 have been overcome and the present application is in a condition for allowance. In addition, in view of the Petition to Make Special that was filed November 21, 2003, it is earnestly solicited that further examination be promptly conducted and a Notice of Allowance issued as soon as possible in order to avoid any further delays in this long-standing application.

Respectfully submitted,

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Attachment: McGraw-Hill Definition of „Emulsion“